

screen from the A position to the D position, whereas the vibration is slowly generated when the user touches the screen from the E position to the F position due to a bigger gap between touches.

[0050] FIGS. 9A and 9B illustrate the case where a screen is flipped or scrolled in the portable terminal. As illustrated in FIGS. 9A and 9B, in the case of UI flipping or scrolling pages, vibration may be generated by changing the vibration strength depending on the flipping or scrolling, or by changing the vibration strength depending on a flipping or scrolling direction. For example, when the screen is flipped or scrolled from the right to the left as illustrated in FIG. 9A, it is possible to provide the effect that the vibration seems to be shifted from the right to the left by changing the vibration strengths of the vibrators V3 and V4 to be increased and then decreased gradually while changing the vibration strengths of the vibrators V1 and V2 to be decreased and then increased progressively.

[0051] Likewise, when the screen is flipped or scrolled from the bottom to the top as illustrated in FIG. 9B, it is possible to provide the effect that the vibration seems to be shifted from the bottom to the top by changing the vibration strengths of the vibrators V1 and V2 to be increased and then decreased gradually while changing the vibration strengths of the vibrators V3 and V4 to be decreased and then increased progressively.

[0052] FIG. 10 illustrates the case of touching specific shapes on the screen in the portable terminal. When a user circularly touches the screen as illustrated in FIG. 10, vibration may be generated as if the vibration strengths of the respective vibrators are shifted from V2 to V1, V3 and V4. That is, only the vibrator V2 vibrates strongly first. However, as the user's touch position is changed in a circular motion, the vibrator V2 weakly vibrates gradually and the vibrator V1 starts weakly vibrating and then strongly vibrates progressively. By controlling the vibration strength of each vibrator in this manner for the remaining touches, the portable terminal allows a user to feel the circular touch.

[0053] According to the present invention, the portable terminal includes a plurality of vibrators, and the vibration strength of each of the plurality of vibrators is controlled according to a user's touch position and duration of the touch. As a result, vibration can be generated according to a user's touch directionality, thereby allowing the user to feel the 3-dimensional haptic effect.

[0054] The above-described methods according to the present invention can be realized in hardware or as software or computer code that can be stored in a recording medium such as a CD ROM, an RAM, a floppy disk, a hard disk, or a magneto-optical disk or downloaded over a network, so that the methods described herein can be executed by such software using a general purpose computer, or a special processor or in programmable or dedicated hardware, such as an ASIC or FPGA. As would be understood in the art, the computer, the processor or the programmable hardware include memory components, e.g., RAM, ROM, Flash, etc. that may store or receive software or computer code that when accessed and executed by the computer, processor or hardware implement the processing methods described herein.

[0055] While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined

by the appended claims. Therefore, the scope of the invention is defined not by the detailed description of the invention but by the appended claims, and all differences within the scope will be construed as being included in the present invention.

What is claimed is:

1. A method of providing a haptic effect using a plurality of vibrators in a portable terminal, the method comprising: detecting whether user's input information is generated; determining a vibration strength level of each of the vibrators using the user's input information; and generating vibration according to the determined vibration strength via each of the vibrators.
2. The method of claim 1, wherein the user's input information comprises at least one of a user's input position and relative distance between the user's input position and each of the vibrators.
3. The method of claim 2, wherein the user's input position is a position of a screen touched by the user or a position of a keypad activated by the user.
4. The method of claim 2, wherein vibration strength level of the respective vibrators are determined depending on the relative distance between the user's input position and the respective vibrators.
5. The method of claim 2, wherein determining the vibration strength level of each of the vibrators comprises: detecting a duration that the user's input; and determining the vibration strength level according to the relative distance information and the duration of the user input.
6. The method of claim 2, further comprising detecting a shifted input position whenever the user input is shifted.
7. The method of claim 1, wherein determining the vibration strength level of each of the vibrators using the user's input information comprises: detecting a change in the center of gravity or a magnitude of centrifugal force exerted on an object according to a cornering direction of the object; and changing vibration strength level of the respective vibrators to simulate the change in the center of gravity or the magnitude of centrifugal force.
8. The method of claim 1, wherein determining the vibration strength level of each of the vibrators using the user's input information comprises changing vibration strength level of the respective vibrators in sequence according to a first position and a second position of a user's input to simulate avoiding an obstacle.
9. The method of claim 1, wherein determining the vibration strength level of each of the vibrators using the user's input information comprises: detecting a duration that the user input; and generating a stronger vibration for each of the vibrators as the duration is longer.
10. The method of claim 1, wherein determining the vibration strength level of each of the vibrators using the user's input information comprises: detecting a plurality of user's touches in a rotation manner; and generating a rapid vibration on each of the vibrators when a gap between the plurality of user's touches is smaller and generating a slower vibration on each of the vibrators when a gap between the plurality of user's touches is larger.